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Innovation Capability of Jute Product Sales Firms in Bangladesh

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Research Article

Keywords: Bangladesh, Innovation capability, Jute product sales, JDPC, Classification

Posted Date: April 23rd, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9493027/v1

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Additional Declarations: The authors declare no competing interests.

Abstract

This study investigates the business innovation capability of jute product sales firms (JPSFs) in Bangladesh. A questionnaire survey was conducted with the cooperation of the Jute Diversification and Promotion Centre (JDPC) in Dhaka, and qualitative factor analysis and hierarchical clustering were applied. We obtained three main findings. First, sales management of jute products is determined by three factors: 'general resource availability', 'human resource management', and 'internal firm culture orientation'. Second, the firms can be divided into four clusters: a moderate-resource group, a well-funded group, a traditional group, and a resource-constrained group. Third, the innovative cluster is characterised by firms with stronger resource endowments, as indicated by higher export orientation, larger firm size, and product diversification beyond traditional jute products. These results suggest that efforts to promote jute products should consider the cultural and human capital perspectives of sales entities, and support tailored to each entity's capacity structure for innovation will be effective.

Introduction

Jute has historically played a significant role in the national economy of Bangladesh. During the 1950s and 1960s, Bangladesh held a monopolistic position in jute production and marketing. In the 1970s and 1980s, jute constituted the largest portion of the country's exports. However, from the 1990s onwards, the share of raw jute, unprocessed jute fibre and jute products, processed products made almost wholly of raw jute, in exports began to decline due to decreased global demand. In the fiscal year 2022–2023, raw jute and jute goods accounted for 1.54% of Bangladesh's total exports [14]. Figure 1 illustrates the production and export quantities of raw jute and jute products, indicating a downward trend in jute product exports. However, raw jute exports increased due to India importing raw jute from Bangladesh. Conversely, in fiscal year 2023–2024, the Department of Jute, Bangladesh, reported total domestic consumption of jute products at 2.28 million metric tons. Thus, the Bangladeshi jute product sector is struggling to adapt to current conditions. Rahman et al. [32] note that the jute sector is stagnant due to a failure to adjust to the global consumption environment.

Addressing the global market requires efforts at the business establishment level and the fostering of an innovative job environment. Previous research on firm innovation has emphasised entrepreneurial orientation (EO). Miller [30], further developed by Covin and Slevin [9], states that the three components of EO, innovativeness, risk-taking, and proactiveness, must be present for a firm to be considered entrepreneurial. While EO offers significant findings for understanding the mindset of entrepreneurs, it inadequately explains the job environment in developing countries. A supportive working environment is essential for shaping innovation. The Bangladeshi jute sector faces structural limitations, including outdated technologies, limited product diversification, and weak market competitiveness. R&D, knowledge management, employee skills, and technological infrastructure are key components of firms' innovative job environments.

Lawson and Samson [28] define innovation capabilities (ICs) as the ability to continuously transform knowledge and ideas into new products, processes, and systems that benefit the company and its stakeholders. They present seven dimensions of ICs: vision and strategy, leveraging the skill base, organisational intelligence, creativity and idea management, organisational structure and systems, culture and climate, and technology management. In contrast, Zawislak et al. [44] identify four key capabilities: technology development, operations, management, and transactions. Saunila and Ukko [35] outline leadership culture, idea and organisation structure, work climate and well-being, know-how development, regeneration, external knowledge, and individual efforts as ICs. Akman and Yilmaz [2] highlight several key factors within firms that contribute to success, including a supportive organisational culture, effective knowledge use for product development, and the capacity to quickly adapt to market changes, such as evolving customer preferences and competing products. ICs are viewed as internal determinants driving continuous innovation and value creation. Moreover, innovation can only occur if the company possesses innovation capacity [26]. To date, no studies have closely examined the internal IC environment of Bangladeshi jute product sales firms (JPSFs).

Considering these studies, focusing on IC is significant given the resource constraints, technological gaps, and market access in developing countries. A research question arises: What factors define the current internal business IC in Bangladeshi jute product sales? This study investigates key dimensions of the business innovation environment and classifies firms. This focus enables an actionable and structural assessment of how jute sector firms develop and sustain innovation, particularly in a resource-constrained and transitioning industrial context. The results provide insights into how these attributes influence jute product sales and offer crucial information about business firms within the broader context of trade, potentially making the jute product business profitable.

Materials and methods

Study framework and method of analysis

This study defines IC as the JPSFs' capacity to generate, adopt, and implement new ideas, techniques, and products that enhance competitiveness, improve efficiency, and enable responses to market and environmental changes, based on the research of Lawson and Samson [28], Zawislak et al. [44], and Saunila and Ukko [35].

Figure 3 illustrates the survey methods and analytical flow of this study, including survey methods, the survey questionnaire, and data analysis methods. We employ qualitative factor analysis with oblique rotation to identify potential factors determining the JPSF's IC, as the underlying factors are expected to be correlated rather than independent [8, 13, 4]. The firm's IC variables are developed based on the aforementioned research. Further details are provided in the 'The firm's five-scale evaluation of innovation indicators' section. We assume that multiple latent factors, such as general resources, organisational culture, human resource management, and technological advances, explain the observed variance in innovation-related indicators. Subsequently, we apply cluster analysis to detect JPSFs with

similar characteristics and examine those characteristics based on their factor scores [23]. Analyses were performed using R.

Data collection

To identify the current situation of jute sales promotion and management strategies, this study conducted onsite face-to-face interviews using a structured questionnaire at the Jute Diversification and Promotion Centre (JDPC) in Dhaka, Bangladesh, in May 2023. The interview questionnaire comprises five sections. The first investigates the organisational structure. The second includes training and promotional activities to understand new entries in the jute sector and the spread of jute products. The third section examines design improvements and brand-building efforts. The fourth section addresses support for new entrants. The final section explores the challenges faced by jute entrepreneurs in popularising jute products.

Then, we developed a structured questionnaire based on the preliminary interviews with JDPC and previous studies. The data collected encompassed four main aspects: (1) individual attributes such as respondents' characteristics, gender, and age; (2) business attributes such as business location, number of branches, employees, etc.; (3) resource conditions such as manpower, machines, cash, technology, etc.; and (4) innovation, which included internal training opportunities, the culture of thinking big, calculated risk-taking, etc. 5-point Likert-scale was used for sections (3) and (4). Between January and April 2024, the JDPC randomly distributed the survey questionnaires via Google Form to approximately 200 JPSF members out of a total of around 800, using their phone numbers and email addresses, due to limitation of JDPC resources. The questionnaire was sent to the managers with a comprehensive understanding of the entire firm. Figure 4 illustrates the locations where data were collected, along with the corresponding quantities of data obtained from each site. A total of 53 members responded.

Results

Characteristics of JDPC

Figure 5 presents the characteristics of JDPC and illustrates the material flow of jute from cultivation to export or local market sales. JDPC activities include collecting jute fabric and assisting jute firms in producing jute products for export or local sales. Additionally, their training function focuses on teaching entrepreneurs how to make jute products from jute fabric based on contemporary design and market demand. JDPC also engages in promotional activities for market expansion, both domestically and overseas.

Source: Created by the authors

JDPC interview evidence

The interview evidence reveals that JDPC plays a central role in promoting jute sector revitalization through training, design improvement, branding, and entrepreneurial support. It primarily targets young and educated individuals by offering low-cost training programs and facilitating access to finance, raw materials, and market platforms. JDPC also conducts promotional activities such as workshops, exhibitions, and seminars to expand both domestic and international markets. While these efforts have contributed to increased product diversification and the emergence of new entrepreneurs, the interviews highlight several critical challenges, including reliance on traditional training and promotional methods, limited global market reach, raw material shortages, and insufficient skilled labor. Additionally, gender imbalance within the organization and weak linkage with farmers constrain effectiveness. The evidence suggests that despite notable progress, JDPC requires modernization, stronger institutional support, and strategic reforms to enhance its impact on the jute sector. Therefore, it is critical to identify the firms' present business ICs.

Business characteristics of the collected firms

Understanding the features of the JPSFs involved capturing data on business age, location, firm size (in terms of number of employees), nature of business products, export status, and B2B (business-to-business) percentage, as presented in Table 1. Most firms are located in Dhaka (26.42%), the capital of Bangladesh, followed by Chittagong (16.98%) and Rajshahi (16.98%). The results indicate that jute product businesses are primarily concentrated in megacities. The study reveals that most businesses have operated for five to less than ten years (30.19%), followed by ten to less than fifteen years (26.42%), less than five years (24.53%), and fifteen to less than twenty years (16.98%), showing that the majority of firms are relatively new. In terms of firm size, small and medium-sized enterprises dominate. The largest proportion of firms (33.96%) employs between 10 and 49 individuals, indicating a concentration in the lower tier of small enterprises. Firms with fewer than 10 employees and those with 50 to 99 employees each constitute 13.21%, further emphasising the prevalence of smaller structures. Mid-sized firms, particularly those employing between 100 and 149 workers, represent 15.09%. Firms in the 150–199 and 200–249 employee ranges each account for 11.32%. In contrast, only 1.89% of firms have 250 or more employees, indicating that large-scale enterprises are significantly underrepresented. This structure indicates limited organisational capacity and resource availability.

Table 1
Business attributes of JPSFs

Characteristics	Percentage	Characteristics	Percentage
Business Location		**Product type**	
Dhaka	26.42	100% jute products	58.49
Chittagong	16.98	More than 50% jute products	32.08
Barisal	3.77	Less than 50% jute products	9.43
Sylhet	7.55	**Export Percentage**	
Mymensingh	9.43	0	15.09
Rajshahi	16.98	10	13.21
Khulna	5.66	20	26.42
Rangpur	13.21	30	20.75
Business age		40	13.21
< 5 years	24.53	50	5.66
>=5 years and < 10 years	30.19	60	1.89
>= 10 years and < 15 years	26.42	90	1.89
>= 15 years and < 20 years	16.98	100	1.89
>= 20 years	1.89	**B2B Percentage**	
Firm Size (Employees)		10	11.32
< 10	13.21	20	13.21
>=10 and < 50	33.96	30	24.53
>=50 and < 100	13.21	40	26.42
>=100 and < 150	15.09	50	13.21
>=150 and < 200	11.32	60	5.66
>=200 and < 250	11.32	70	5.66
250 or more employees	1.89		
Source: Created by the authors			

Regarding the product nature, most firms are solely engaged in jute products, followed by those with more than 50% involvement, and less than 50%, indicating a strong sectoral focus. Regarding sale types, the highest export percentage was 20%, with 26.42% of the firms engaged in this level of export,

followed by 30% export (20.75%). For B2B sales, the most common percentage was 40%, accounting for 26.42% of firms, followed by 30% B2B sales (24.53%). These results indicate that JPSFs should enhance efforts in product research, innovation, marketing, and promotional activities to penetrate both overseas and domestic markets.

Firm's five-point evaluation of innovation indicators

Table 2 presents the responses related to the firm's IC indicators, indicating percentage values. The indicators are categorised into four groups: general resources, organisational internal culture, human resource management, and technological advances. General resources refer to organisational assets that underpin both routine operations and innovation. They include personnel resources, such as the number of employees allocated across activities; current assets, including cash, that support liquidity and operational flexibility; and fixed capital, encompassing machinery, equipment, and production facilities that establish the long-term infrastructure for production and development. Organisational internal culture refers to shared values and norms that shape how members pursue opportunities and make strategic decisions, including orientations toward ambitious goals and calculated risk-taking. Human resource management includes internal training and development to enhance employees' skills and capabilities; talent attraction through policies; talent retention to keep employees engaged and committed; and the active inclusion of women and younger employees to promote gender equity and generational diversity as strategic resources. Lastly, technological advances consist of traditional technology (T. technology), which aims to preserve tradition; modern technology (M. technology), which accepts new or modified technology; and collaboration with other business organisations for product development.

The results indicate that a majority of respondents disagree that the number of employed people, current assets (cash), and fixed capital are sufficient. These findings suggest that many firms in the sample lack adequate human and financial resources. Conversely, most respondents agree that firms have a culture of thinking big and taking calculated risks. Additionally, most firms provide internal training opportunities, attract talent, and retain talent, and involve the new generation in jute product development. Furthermore, the majority strongly agree about women's involvement (W. involvement) in jute product development, agree with traditional technology (T. Technology), and collaborate with other firms. Finally, most of the respondents strongly agree that firms are open to accepting new or modified technology (M. Technology).

Table 2
IC indicators of JPSFs

Name of indicators	Definitions	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
	General resources					
Personnel	The number of employed persons is enough in terms of the firm's scale.	16.98% (9)	37.73% (20)	22.64% (12)	22.64% (12)	
Current asset	Cash as a current asset is enough in terms of operating the firm's businesses.	24.52% (13)	35.84% (19)	16.98% (9)	18.86% (10)	3.77% (2)
Fixed capital	Fixed capital, such as production equipment, is enough in terms of operating the firm's businesses.	18.86% (10)	30.18% (16)	22.64% (12)	26.41% (14)	1.88% (1)
	Organisational internal culture					
Thinking big	The organisation has an internal culture of thinking big to foster innovation.		7.54% (4)	22.64% (12)	56.60% (30)	13.20% (7)
Calculated risks	The organisation has an internal culture of calculated risks to foster innovation.		7.54% (4)	20.75% (11)	54.7% (29)	16.98% (9)
	Human resources management					
Internal Training	The organisation provides the internal training opportunity for labourers to get new skills.		3.77% (2)	5.66% (3)	67.9% (36)	22.64% (12)
Attracts talent	The Organisation attracts talent, e.g.,			11.32% (6)	49.05% (26)	39.62% (21)

Source: Created by the authors

Name of indicators	Definitions	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
	General resources					
	the recruit is going well.					
Retains talent	The Organisation retains talent, e.g., by working on employees' job satisfaction.		1.88% (1)	26.41% (14)	49.0% (26)	22.64% (12)
W. involvement	Women's ideas are used in your product development enough.	1.88% (1)	5.66% (3)	1.88% (1)	18.86% (10)	71.69% (38)
Y. involvement	Young people's (20s or 30s) ideas are used in your product development enough.	3.77% (2)	7.54% (4)	16.98% (9)	37.73% (20)	33.96% (18)
	Technological advances					
T. technology	The organisation prefers (wants to preserve) traditional technology.		3.77% (2)	24.52% (13)	58.49% (31)	13.20% (7)
M. technology	The organisation is open to accepting new or modified technology. e.g., modern equipment.			11.32% (6)	43.39% (23)	45.28% (24)
Collaboration	The organisation is open to collaborating with other business organisations for product development		3.77% (2)	20.75% (11)	41.5% (22)	33.96% (18)
Source: Created by the authors						

Numbers in parentheses indicate the number of responses.

Factor analysis

To assess the dataset's suitability for factor analysis, the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity were conducted. The overall KMO value should be 0.6 or higher to perform factor analysis [39]. The KMO measure yielded a value of 0.6, indicating marginal sampling adequacy; therefore, the factor analysis results should be interpreted with caution. Bartlett's test of sphericity produced a chi-square statistic of 205.042, statistically significant at $p < 0.000$. These results indicate that the dataset meets the minimum statistical requirements for factor analysis. Although the sample size is relatively small (n = 53), it is considered acceptable for factor analysis when communalities are moderate and factor loadings are sufficiently high, as suggested in previous methodological studies.

A maximum likelihood factor analysis with Promax rotation was performed on a Polychoric correlation matrix derived from 13 indicators of firm innovation (Table 4) [20]. The analysis yielded a three-factor solution demonstrating appropriate model fit. The chi-square test was non-significant, $\chi^2(42) = 38.61$, $p = 0.621$, suggesting that the model adequately represented the observed data [25]. Additional fit indices supported this conclusion, including a Root Mean Square of the Residuals (RMSR) of 0.068, a Tucker–Lewis Index (TLI) of 1.05, and a Root Mean Square Error of Approximation (RMSEA) of 0.00 with a 90% confidence interval of [0.00, 0.0824] [6, 21]. Three factors were extracted based on eigenvalues greater than 1, with eigenvalues of 2.542, 1.738, and 1.383. The three extracted factors accounted for 43.6% of the total variance: Factor 1 explained 19.6%, Factor 2 explained 13.4%, and Factor 3 accounted for 10.6%. Table 3 shows the factor loadings, representing the correlations between the factors and variables. Variables with large loading values > 0.40 were used for interpreting the factors [37].

Factor 1 represents 'general resource availability', with high loadings for Current asset (0.893), Personnel (0.881), and Fixed capital (0.739), indicating a firm's financial and operational capacity to support innovation. Notably, T. technology had a moderately negative loading on this factor (-0.484), suggesting a trade-off between traditional resource investments and new technology applications. Factor 2 can be interpreted as 'human resource management', marked by strong loadings from W. involvement (0.920), Attracts talent (0.553), Y. involvement (0.515), and Internal training (0.427), emphasising the role of employee engagement and talent development in fostering innovation.

Table 3
Potential factors affecting ICs of JPSFs

Variables	Factor 1	Factor 2	Factor 3	Communality
General resources				
Personnel	**0.881**	-0.121	0.176	0.8026
Current asset	**0.893**	0.081	0.012	0.8052
Fixed capital	**0.739**	0.007	-0.077	0.553
Human resource management				
Internal Training	-0.093	**0.427**	-0.134	0.169
Attracts talent	-0.181	**0.553**	0.082	0.375
Retains talent	-0.001	0.077	0.13	0.0297
W. involvement	0.025	**0.920**	-0.071	0.8076
Y. involvement	0.143	**0.515**	0.249	0.4352
Firm culture				
Thinking big	-0.05	-0.03	0.362	0.1277
Calculated risks	-0.284	-0.197	**1.002**	0.995
Technological advances				
T. Technology	**-0.484**	0.014	0.241	0.2974
M. Technology	0.093	0.361	-0.011	0.137
Collaboration	0.178	-0.008	0.315	0.1282
Source: Created by the authors				

Factor 3 is interpreted as ‘firm internal culture orientation’, with calculated risks loading very strongly (1.002), indicating that risk-taking is a dominant element and suggesting that visionary thinking is a relevant characteristic. These three factors capture the key dimensions shaping firms’ ICs. The factor structure indicates that innovation is not solely resource-driven but also significantly influenced by cultural and human capital dimensions.

Cluster analysis

Hierarchical cluster analysis classified firms based on their factor scores. Factor scores were calculated using the regression method based on estimated factor loadings from the maximum likelihood factor analysis with Promax rotation [41, 19]. This approach generates standardised continuous scores for each latent factor by weighting observed innovation indicators according to their factor loadings and

inter-factor correlations. The resulting factor scores represent each firm's relative position on the underlying IC dimensions and served as input variables for the hierarchical cluster analysis. The analysis utilised Ward's method with the Euclidean distance measure, recommended for generating compact and distinct clusters [24]. This method was chosen because it does not require prior knowledge of the number of clusters and is suitable for relatively small datasets, such as the present sample of 53 firms [36]. The optimal number of clusters was determined using a dendrogram, indicating four clusters (Fig. 6). Additionally, the 'NbClust' package in R evaluates multiple cluster validity indices [10]. The majority of these indices suggested a four-cluster solution, indicating distinct groupings among the surveyed firms (Table 4).

Source: Created by the authors

Cluster 1 (CL1) consists of 14 firms and shows moderate levels of general resources (Factor 1's average score = 0.306) and human resource management (Factor 2's average score = 0.336), but a significantly low internal culture practice score (Factor 3's average score = -1.320). Cluster 2 (CL2) includes 11 firms and exhibits the highest positive scores across all three factors, particularly in general resource availability (Factor 1's average score = 1.1802) and internal culture (Factor 3's average score = 0.723). Cluster 3 (CL3) is the smallest group, comprising eight firms with low resource availability (Factor 1's average score = -0.064), low human resource management (Factor 2's average score = -1.790), and a weak innovation-supportive culture (Factor 3's average score = 0.045), suggesting a weak innovation cluster. Finally, Cluster 4 (CL4), comprising 20 firms, is characterised by limited general resource availability (Factor 1's average score = -0.837) but relatively strong human resource management (Factor 2's average score = 0.356) and firm culture (Factor 3's average score = 0.506). This group reflects firms operating under resource constraints yet managing to foster effective human resource management and a culture conducive to innovation.

Table 4
Clustering results

Cluster	Number of firms	Factor 1(General resource availability)	Factor 2 (Human resource management)	Factor 3 (Firm internal culture)
1	14	0.306	0.336	-1.320
2	11	1.180	0.229	0.723
3	8	-0.064	-1.790	0.045
4	20	-0.837	0.356	0.506
Source: Created by the authors				
Factor values indicate the average factor scores				

Relation between business attributes and clusters

Table 5 illustrates the variation in business characteristics across the four clusters. The clusters exhibit clear differences in location, firm age, size, product type, export orientation, and B2B share.

CL1 consists mainly of firms located in Dhaka and Rangpur, with moderate representation in Barisal and Sylhet, indicating geographic dispersion. Most firms are relatively young, with over 60% operating for less than 15 years. In terms of firm size, 42.86% are small to medium-sized (10 to fewer than 50 employees). 71.43% produce exclusively jute products, reflecting a strong commitment to the sector. A significant proportion (35.71%) exports around 30% of their products, indicating moderate export engagement. B2B activity is concentrated mainly at 10% to 40%.

CL2 shows a higher concentration in Dhaka, indicating proximity to the key business centre. These firms tend to be more mature, with 36.36% having operated between 15 and 20 years. The majority are small to medium-sized, with 36.36% employing 10 to fewer than 50 workers. This cluster is characterized by high product specialisation, with 81.82% producing only jute goods. Export activity is diversified, ranging from 10% to 50% and 90% to 100%, while 36.36% conduct around 40% of their business through B2B transactions.

CL3 is the smallest group, comprising eight firms, primarily located in Dhaka and Rajshahi, reflecting a mixed geographical spread. Most firms are newly established (62.50% under five years old) and small

Table 5 Business attributes in each cluster				
	Cluster 1	**Cluster 2**	**Cluster 3**	**Cluster 4**
Business attributes	(14)	(11)	(8)	(20)
Business location				
Dhaka	28.57	27.27	50.0	15.0
Chittagong	7.14	9.09		35.0
Barisal	14.29			
Sylhet	14.29	18.18		
Mymensingh	7.14	9.09		15.0
Rajshahi		9.09	50.0	20.0
Khulna		18.18		5.0
Rangpur	28.57	9.09		10.0
Business age				
< 5 years	21.43		62.50	25.0
>= 5 and < 10 years	42.86	36.36	12.50	25.0
>= 10 and < 15 years	21.43	27.27	12.50	35.0
>=15 and < 20 years	14.29	36.36	12.50	10.0
>= 20 years				5.0
Firm size (Employees)				
< 10	21.43	9.09	37.50	
>=10 and < 50	42.86	36.36	37.50	25.0
>=50 and < 100		9.09	12.50	25.0
>=100 and < 150	14.29	18.18	12.50	15.0
>=150 and < 200	7.14	18.18		15.0
>=200 and < 250	14.29			20.0
250 or more employees		9.09		
Product type				
Source: Created by the authors				

Table 5 Business attributes in each cluster

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
100% jute product only	71.43	81.82	75.0	30.0
More than 50% jute products	21.43	18.18	25.0	50.0
Less than 50% jute products	7.14			20.0
Export percentage				
0%	28.57		50.0	
10%		18.18		25.0
20%	14.29	18.18	12.50	45.0
30%	35.71	18.18	25.0	10.0
40%	14.29	18.18	12.50	10.0
50%		9.09		10.0
60%	7.14			
90%		9.09		
100%		9.09		
B2B percentage				
10%	21.43		12.50	10.0
20%	14.29	18.18	25.0	5.0
30%	28.57	18.18	12.50	30.0
40%	28.57	36.36	25.0	20.0
50%	7.14	18.18	12.50	15.0
60%				15.0
70%		9.09	12.50	5.0

Source: Created by the authors

(37.50% with fewer than 10 employees). A strong commitment to the sector is reflected by the fact that 71.43% produce primarily jute products. Half report no export activity, suggesting a domestic market orientation. In B2B involvement, 25% of firms report up to 40% of sales through inter-firm transactions, indicating reliance on a few large buyers.

CL4 is the largest and most diversified, primarily from Chittagong and Rajshahi. It includes relatively older and larger firms; about 35% have operated for more than 10 years, and 20% employ 200 or more workers. Export engagement is stronger in this group, with 45% exporting around 20% of output. Approximately 30% of firms engage in 30% B2B activities, demonstrating some inter-firm linkages. In contrast to other clusters, only 30% produce 100% jute products, while 50% produce a majority (> 50%) of jute-based items, indicating diversification beyond traditional jute lines.

Relation to regional product characteristics

The regional variation in top jute products by sales value in Bangladesh reveals key insights into market preferences and potential areas for targeted product development and marketing strategies (Table 6). In most regions, including Dhaka, Chittagong, Barisal, Sylhet, Mymensingh, and Rajshahi, jute bags and office accessories repeatedly rank among the top three products, indicating widespread demand. Notably, decoration items rank highest in Mymensingh and Rajshahi, reflecting a strong cultural and aesthetic preference. In contrast, Khulna shows a unique pattern where paper and pulp products top the sales rankings, implying a regional specialisation and industrial demand distinct from other areas. Similarly, Rangpur stands out with carpets and floor mats as the leading product, possibly reflecting localised usage patterns and production capabilities.

Table 6
Characteristics of jute products in regions of Bangladesh

Region	**Top 3 jute products in terms of sales value**
	1. Bags for various purposes
Dhaka, Chittagong, Barisal, and Sylhet	2. Office accessories, such as file cover, pen holder, etc.
	3. Decoration items such as wall hangings, etc.
	1. Decoration items such as wall hangings, etc.
Mymensingh and Rajshahi	2. Bags for various purposes
	3. Office accessories, such as file cover, pen holder, etc.
	1. Paper and pulp
Khulna	2. Bags for various purposes
	3. Office accessories, such as file cover, pen holder, etc.
	1. Carpet/Floor mat
Rangpur	2. Bags for various purposes
	3. Office accessories, such as file cover, pen holder, etc.

Source: Based on an additional survey conducted in 2025

Discussion

IC encompasses the internal resources, processes, and competencies that enable a firm to systematically develop and implement innovation [28]. EO reflects intentions and behaviours, while IC reflects the capacity and mechanisms to execute innovation [27, 42]. Given global shifts toward sustainable materials, JPSFs must enhance their capacity for innovation in product development, design, and marketing to meet evolving demands. Strengthening IC enables firms to overcome resource constraints and institutional gaps, positioning the sector for higher value creation and long-term resilience. ICs could be leveraged to develop innovative solutions that align with long-term sustainability targets [1].

This study explores the dimensions of organisational ICs in the jute sector and identifies distinct firm profiles based on these capabilities. The first factor, 'general resource availability', included high loadings from variables such as personnel, current assets, and fixed capital, reflecting a firm's access to material and financial resources. The enterprise resource system positively impacts firm performance [18]. Additionally, Xu et al. [43] illustrate that cash plays a critical role in a firm's innovative performance, indicating an opportunity for innovative jute products. However, few studies argue that excessive financial slack may reduce efficiency and weaken innovation incentives [16, 40]. The second factor, 'human resource management', is characterised by internal training, talent attraction and retention, and involvement of women and youth, highlighting strategic human resource practices that foster innovation. This finding aligns with [33], who reported that people are the most valuable resources within an organisation, and effective management of personnel enhances company performance. Using data from 147 start-ups, Slávik et al. [38] claim that quality personnel and their qualified actions positively impact start-up performance. Nevertheless, some studies suggest that investment in human resources does not always lead to improved performance, particularly when skills are underutilised or when organisational structures fail to support effective knowledge application [7, 17]. The third factor, 'firm culture orientation', involves dimensions such as risk-taking, linked to entrepreneurial and adaptive cultures. Firms with advanced enterprise risk management exhibit higher performance levels [15]. However, contrasting evidence indicates that excessive risk-taking and poorly managed organisational cultures may lead to instability and reduced firm performance [5, 42]. While these findings support prior literature indicating that resource availability, human capital investment, and organisational culture are foundational to innovation [11, 22], the mixed evidence suggests that their effects are context-dependent and may vary depending on implementation, management quality, and external conditions.

Regarding the JPSFs classification, the results of the cluster analysis based on factor scores grouped 53 firms into four distinct clusters. CL1 has adequate tangible and managerial resources but lacks an adaptive organisational culture, which may limit innovation outcomes. An absence of strong cultural values may thus restrict innovation potential despite moderate resources. Conversely, CL2 consists of firms with strong resource capacity and moderate levels across other dimensions, such as human resource management and firm internal culture, indicating well-funded firms. These firms may rely more on structural advantages than on dynamic organisational practices (e.g., employee involvement, cultural

transformation) to drive innovation. Furthermore, CL3 displays low scores in general resource availability, human resource engagement, and firm internal culture, indicating a traditional organisational profile with limited innovative orientation, where innovation is not embedded in practices and values. Lastly, CL4 includes firms with low resource availability but moderate levels of human resource management and cultural orientation, representing resource-constrained firms with an internal commitment to innovation. The clustering reflects heterogeneity in IC across firms in the jute sector.

Finally, the relationship between business attributes and cluster membership supports these interpretations. For instance, Cluster 2 had a higher representation in terms of export percentages and medium to large firm sizes, consistent with its strong resource base. In contrast, smaller and newer firms with limited resources in Cluster 3 face significant constraints. Cluster 4 showed greater diversification, producing both pure and mixed jute products, while Cluster 1 was more specialised, with most firms producing 100% jute products. These differences suggest that Cluster 4 firms cultivate a growth-oriented, outward-looking internal culture, whereas Cluster 1 represents smaller, locally focused enterprises emphasising traditional jute production, reflecting their lack of organisational internal culture practices. Thus, to establish themselves, firms may consider product diversification.

We also found that business location characteristics shape jute product innovation across different regions. In metropolitan and trade-oriented areas like Dhaka, Chittagong, Barisal, and Sylhet, firms exhibit greater product diversity, offering bags, office accessories, and decorative items. This reflects strong market linkages, higher consumer demand, and better access to export opportunities, which foster broader ICs [31, 3]. In contrast, semi-urban regions such as Mymensingh and Rajshahi focus on decorative items and bags, indicating artisan-based, demand-driven innovation but limited diversification compared to metropolitan centres. Khulna, as an industrial hub with established jute mills, shows a distinct pattern in paper and pulp production, highlighting how industrial infrastructure supports process innovation and material-based applications [29]. Meanwhile, Rangpur, in a peripheral and resource-driven context, emphasises carpet and floor mat production alongside basic product categories, suggesting innovation is constrained by weaker market access and limited institutional support [12].

By integrating factor analysis and cluster analysis, this study provides one of the first empirical examinations of IC structures among jute product sales firms in Bangladesh. Academically, this study emphasises the importance of contextualising innovation by demonstrating how firms in traditional industries develop and express innovation differently due to resource, technology, and institutional constraints. This approach aligns with and extends recent studies advocating for more sector-specific and geographically diverse investigations into ICs [28, 34]. By integrating structural and behavioural dimensions of IC in a developing-country context, the study advances understanding of firm-level innovation differences and provides implications for innovation policy in traditional industries.

Several policy implications can be proposed. The results indicate the need for cluster-specific policy design. Well-funded firms should receive support through policies facilitating advanced product design, branding, export upgrading, and integration into global value chains. In contrast, firms with resource

constraints but internal commitment to innovation would benefit from targeted financial instruments, such as low-interest loans, matching grants, and innovation incubation programs, to convert organisational motivation into marketable innovations. Firms with moderate resources but weak cultures require managerial and organisational development interventions to foster strategic vision, calculated risk-taking, and employee engagement to utilise their existing innovation potential. Moreover, firms with weak innovation capability profiles require more fundamental interventions, including managerial training, institutional mentoring, and exposure to best practices, before advanced innovation incentives become effective. Lastly, the observed regional variation in product specialisation and innovation orientation indicates the importance of location-specific innovation strategies. Adopting a regional innovation system perspective can help reduce spatial disparities and support balanced sectoral development.

Finally, this study has limitations that should be acknowledged. First, it does not adequately examine the causal relationships influencing the JPSF's business development. A long-term perspective is necessary to determine what kind of business environment will lead to revenue growth for this sector. Therefore, the study results should be viewed as providing limited insight into the development of traditional agriculture-related enterprises in developing countries. Second, the study does not address the business innovation environment outside of the JPSFs or the relationship between input resources and output products in manufacturing, as it focuses exclusively on the internal business environment. This suggests that further research is needed to enhance understanding of value creation and the role of jute-based businesses. Clarifying these points will likely deepen the understanding of the business innovation environment in developing countries.

Conclusion

This study investigates the internal business innovation capability (IC) of Bangladesh's JPSFs to identify the underlying factors defining their IC and to classify JPSF types based on IC levels. The potential factors are 'general resource availability', 'human resource management', and 'firm internal culture orientation'. The factor structure suggests that innovation is influenced by resources, organisational cultural, and human capital. We classify JPSFs into four groups: moderate-resource firms with weak internal cultural strength, well-funded firms, a traditional group, and resource-constrained firms committed to innovation. General resource availability and human resource management are key differentiators between well-funded and traditional firms. Innovative firms are characterised by stronger funding, higher export orientation, larger sizes, and product diversification. These attributes indicate adaptability and strategic resource investment, enabling these firms to sustain innovation and pursue growth more effectively than resource-constrained or traditional firms. This study provides a comprehensive framework for understanding how firms develop and sustain innovation capabilities in Bangladesh and other Asian developing countries.

The novelty of this study lies in identifying ICs and innovation patterns in Bangladesh's traditional agribusiness sectors. Previous studies on innovation and entrepreneurship have not focused on these

aspects; thus, this study fills an important research gap and advancing scholarly discourse in the field. Consequently, this research serves as a significant resource for innovation and entrepreneurship studies in developing countries, particularly useful for discussing the innovation environment in declining industries.

From a policy perspective, the results indicate a need for a differentiated innovation support framework based on firms' IC levels. Innovation policies in underdeveloped countries should alleviate business development constraints by considering differences in internal development capability. Financial instruments, such as concessional loans and innovation grants, are crucial for overcoming commercialisation barriers, while complementary capacity-building initiatives are needed to strengthen managerial competence, organisational learning, and risk management.

Finally, the results and limitations of this study could expand the scope of future research. It is important to examine the innovative environment both within and outside businesses from a long-term perspective to clarify causal factors governing traditional business development. Discussions about economic ecosystems are gaining traction, especially in developed nations. By approaching the innovative environment from the perspective of collaborative relationships with external organisations, more in-depth research can be developed. These points will be addressed in future research.

Declarations

Competing Interests

The authors declare that the manuscript is original and has not been published elsewhere, and they have no competing interests.

Author contributions

The first author contributed to the conception of the study, the design of the research and data collection, and the conduct of analyses, as well as writing the text. The second author contributed to the planning of the research, the design of the framework and the analysis, and provided supervision and text modifications.

Acknowledgement

This work was supported by the Otsuka Toshimi Scholarship Foundation and JSPS KAKENHI Grant Number JP22K05865.

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Figures

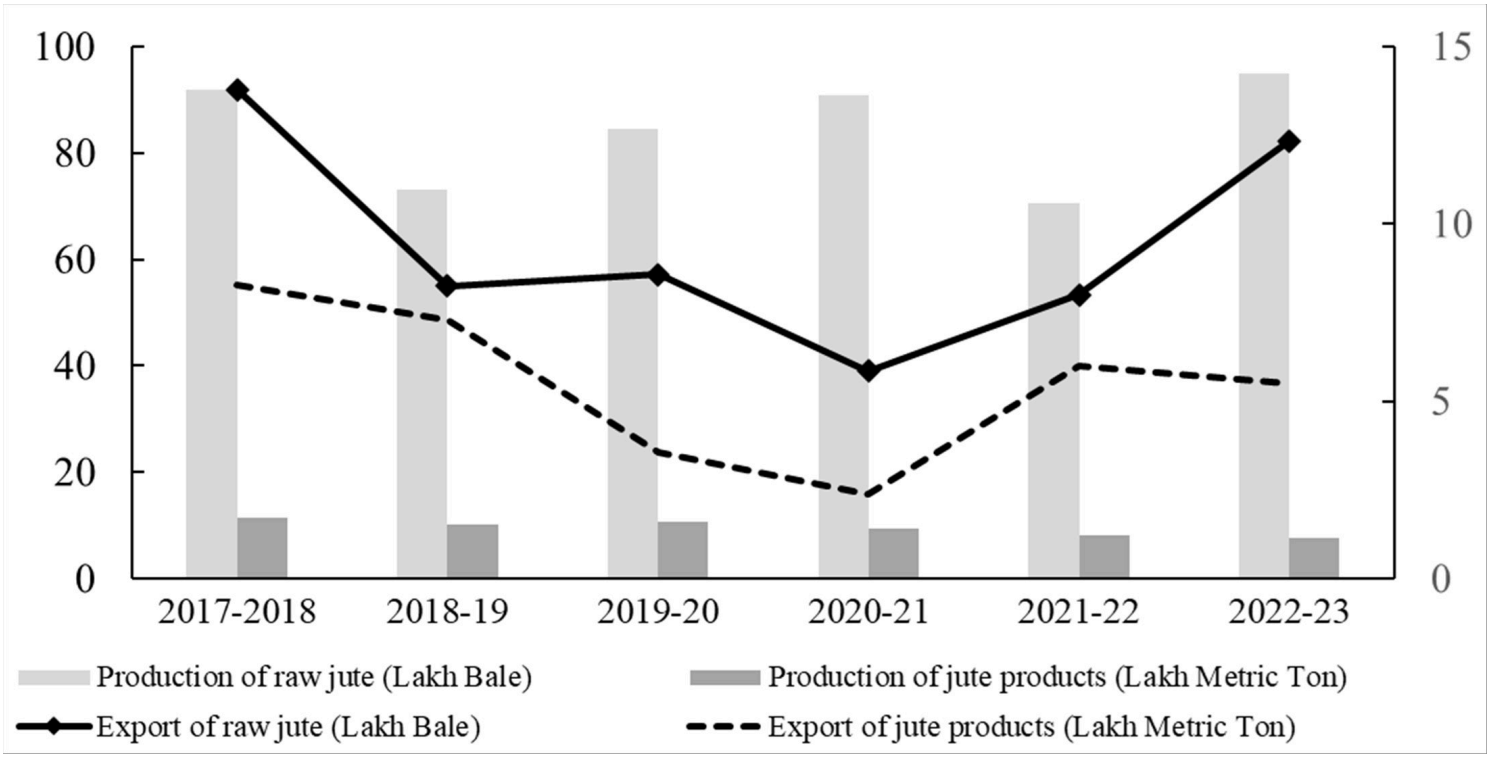


Figure 1

Production and export quantities of raw jute and jute products

Source: Department of Jute, Bangladesh (2025)

Unit one Lakh = one hundred thousand; one Bale = 0.182-ton

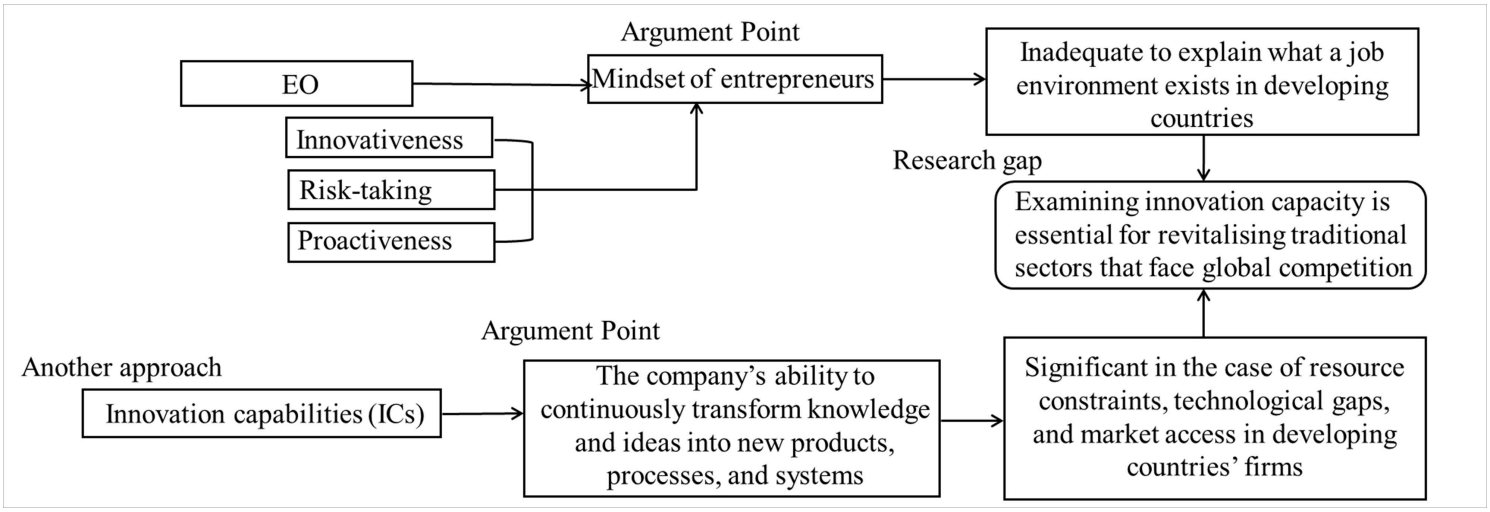


Figure 2

Research gap in previous studies

Source: Created by the authors

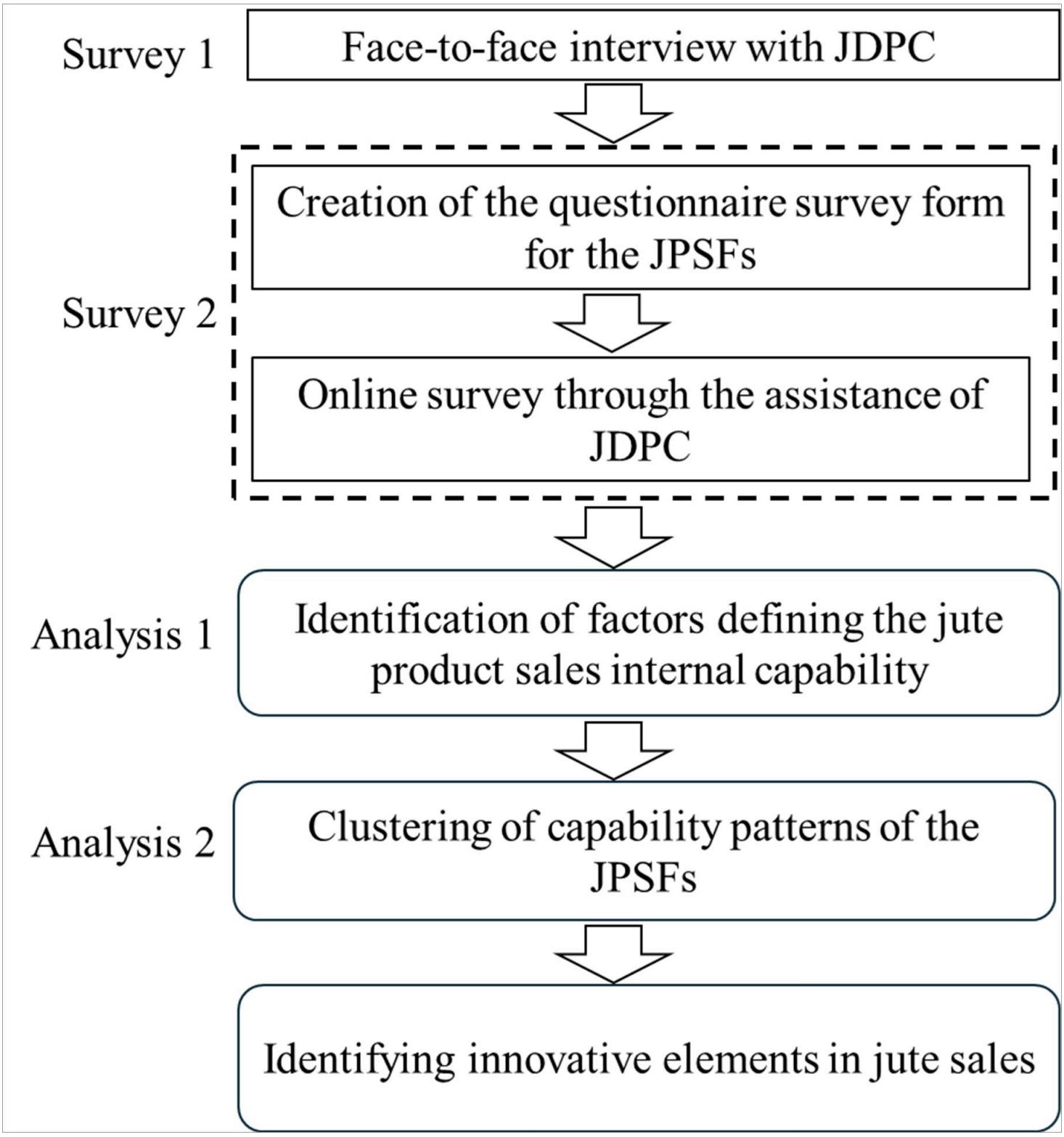


Figure 3

Survey methods and analytical flow

Source: Created by the authors

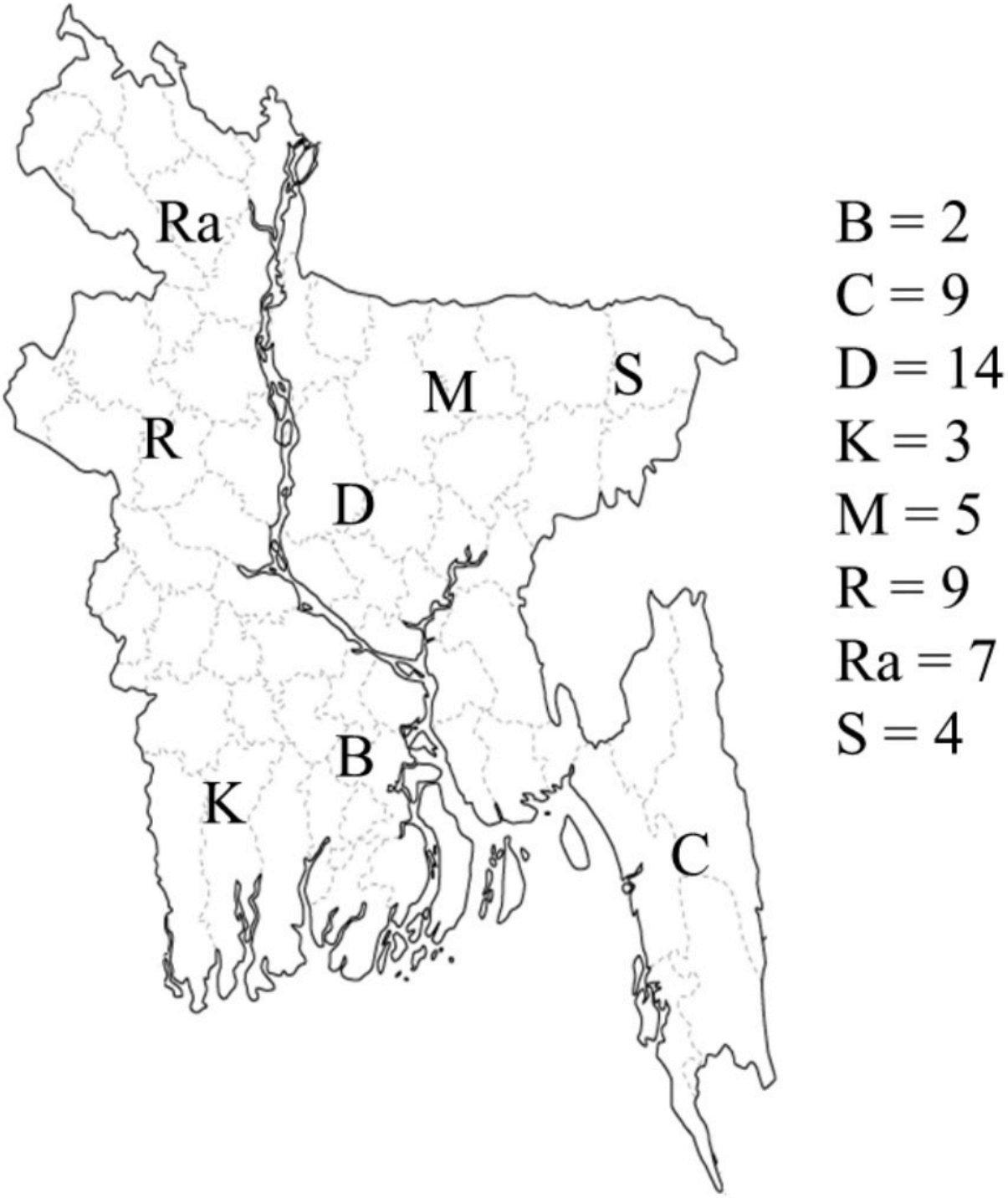


Figure 4

Business locations from which the data were collected

Source: Created by the authors

B, C, D, K, M, R, Ra, and S indicate the study sites Barisal, Chittagong, Dhaka, Khulna, Mymensingh, Rajshahi, and Rangpur, respectively, and the numerical value represents the number of responses.

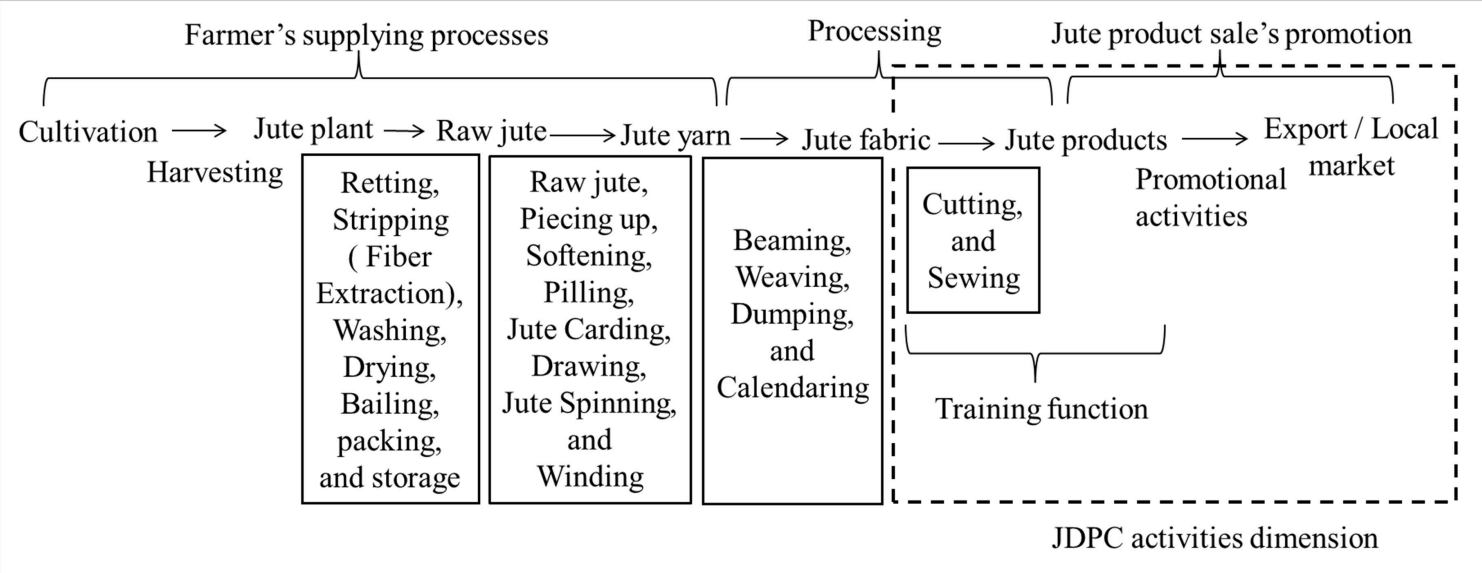


Figure 5

Dimensions of JDPC

Source: Created by the authors

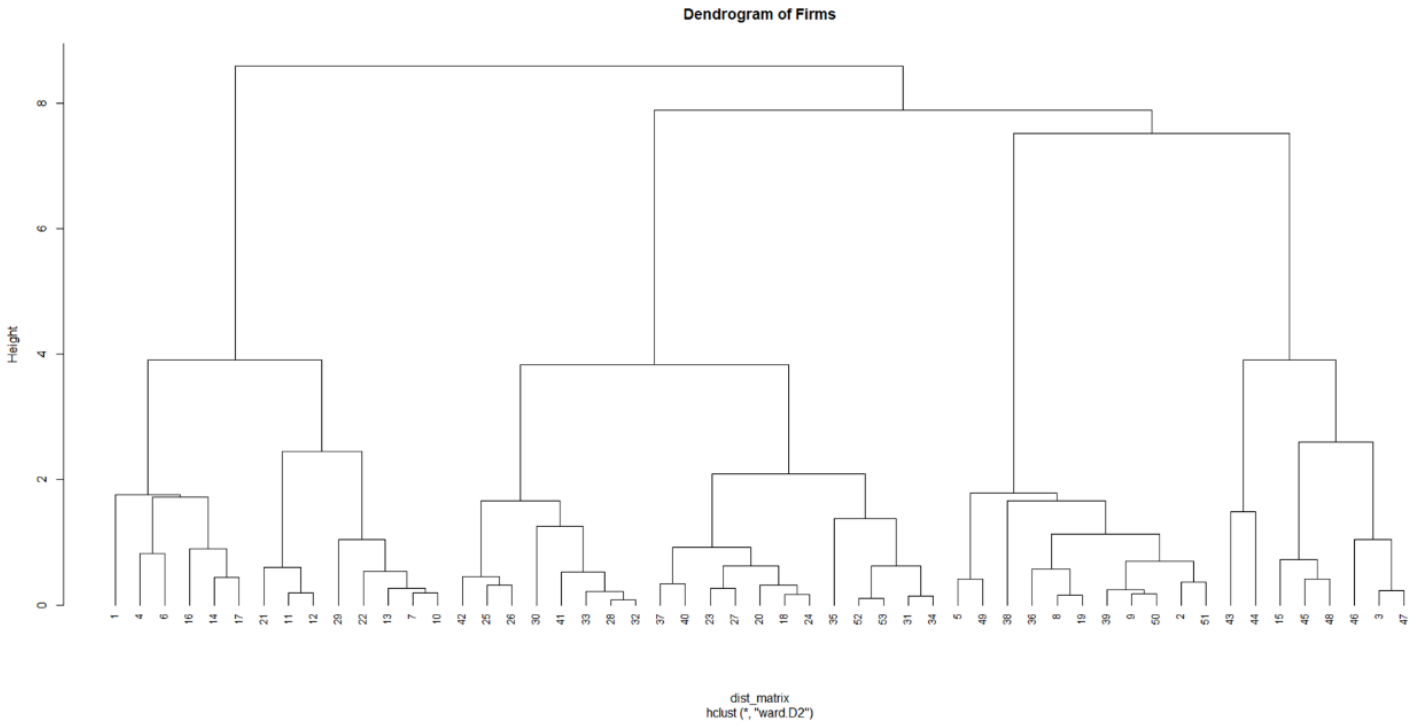


Figure 6

Dendrogram of firms

Source: Created by the authors